REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	July 1996	Final Nov. 1995 - Jun. 1996

4. TITLE AND SUBTITLE

Technology Application and Consulting
(Short Term Project - STP#68)

5. FUNDING NUMBERS

C-SPO
PE-7811s
PR-88003

6. AUTHOR(S)

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8. PERFORMING ORGANIZATION REPORT NUMBER

FTR 19.0

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Defense Logistics Agency
8725 John J. Kingman Road
Ft. Belvoir, VA 22060-6221

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE

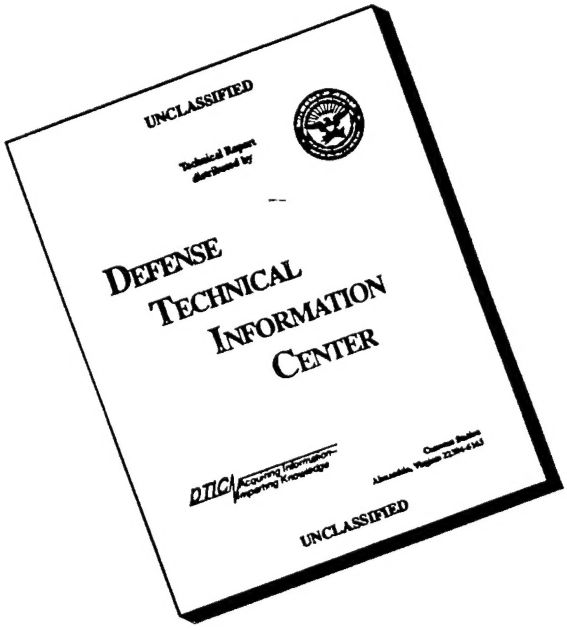
13. ABSTRACT *(Maximum 200 words)*

The objective of this short term project was to provide technical resources to facilitate implementation of new technology by combat ration producers. During the project, senior technical personnel participated in three DLA Process Action Teams (PAT); MRE, Heat & Serve, and Specification. In all cases these PATs were important to technology transfer between team members including combat ration producers, armed services, DPSC, and NRDEC. Technical interchange with the Industrial Base Preparedness group in DPSC focused on high-speed, automated filling equipment. CRAMTD personnel were major technical contributors at the Horizontal Form/Fill/Seal (HFFS) manufacturer/combat ration producer acceptance tests recommending a significant number of design modifications and operating procedures (based on HFFS experience at the CRAMTD Demonstration Site). Further to the HFFS assistance, the CRAMTD Demonstration Site was used to provide a workshop/demonstration production using the CRAMTD HFFS machine. An exhibit, "Developmental Manufacture", was provided at the Spring 1996 Research & Development Associates Meeting and Exposition. It is recommended that a new short term project to continue the major activities conducted during this project.

14. SUBJECT TERMS	15. NUMBER OF PAGES
	42
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

DISCLAIMER NOTICE



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Contents

1.0 CRAMTD STP #68
Results and Accomplishments

1.1 Introduction and Background

STP#68 started November 1, 1995 based on technical and cost proposals dated November 6, 1995 that were submitted to the DLA on November 6, 1995 and ended June 29, 1996. Final approval for the project was received on January 11, 1996. The broad objective of the project was to provide a variety of resources in support of the Combat Ration Advanced Manufacturing Technology Demonstration (CRAMTD) to facilitate implementation of new technology by combat ration producers. Such selected efforts of assistance were of a short time nature and included both industry-wide projects, i.e., implementation of Horizontal Form/Fill/Seal technology, as well as individual producer needs.

In the course of developing and demonstrating the computer integrated manufacturing (CIM) capability at the CAFT/Rutgers Food Manufacturing Technology Facility (FMTF), the staff and coalition members have brought together a significant amount of current technology and the ability to help industry with its implementation. The emphasis on future efforts will be on implementing modernized methods and equipment in the combat ration industrial base to the extent possible. Therefore, aside from working on new developments, a part of the effort of the CRAMTD staff will be to specifically assist ration producers in their unique efforts to modernize individual plants. Working with individual producers, the CRAMTD staff will need to identify the kind of work to be done (assessing present conditions, identifying and planning achievable improvements, in equipment, methods, and management skills, and providing advice, consulting, and guidance), and develop segmented management plans to assign resources and to measure and report progress.

In concert with the above, the DLA Defense Personnel Support Center (DPSC) has defined and funded programs with the Combat Ration Producers to assist in the financial investments required. Recent examples are the procurements of horizontal form/fill/seal machines and the identification /procurement of leak detection technology. The War Stopper classification of Combat Rations may well lead to additional programs in the future.

Also, new Combat Ration activity at Natick Research Development & Engineering Center (NRDEC) anticipates the availability within the Producer community of new production capabilities and packaging materials.

1.2 Results and Conclusions

During STP #68, CRAMTD actively participated in three Process Action Teams (PAT): MRE, Heat & Serve, and Specification. In all cases these PATs have been important to sharing information between Team Members including Combat Ration Producers, Armed Services, DPSC, and NRDEC. A modest amount of work has been conducted at CRAMTD in support of the MRE PAT. The Heat & Serve PAT is developing as an important approach toward recommending the future military feeding system. The Specification Development & Acquisition Process Roadmap defined by the Specification PAT is an important contribution to clearly understanding the Product Definition process and beginning streamlining. Discussion and interim resolution of performance specification issues provide valuable insight into technology needs as well as opportunities for technology transfer. Technology transfer from CRAMTD occurred in the MRE and Heat & Serve PATs as well.

Implementation Planning included interaction with the Industrial Base Preparedness (IBP) group in DPSC and interactions with equipment manufacturers to transfer technology and support the IBP Program. During this STP, these interactions were focused on high-speed, automated filling equipment. In the case of ongoing technology aquisition/transfer Projects, i.e, Polymeric Traypack, Machine Vision Seal Area Inspection, and Leak Detection, interaction with the IBP group was carried out within those projects.

CRAMTD personnel were major technical contributors at the Horizontal Form/Fill/Seal (HFFS) manufacturer/combat ration producer tests (Industry-Wide Implementation Assistance). Technical personnel contributed a significant number of recommendations for design modification and operating procedures.

Further to the HFFS assistance, the Food Manufacturing Technology Facility (CRAMTD Demonstration Site) was used to provide a workshop/demonstration production using the CRAMTD HFFS machine (Tiromat).

Other conferences attended during the STP included the Spring 1996 R&DA Meeting and Exposition at which CRAMTD manned an exhibit on "Developmental Manufacture" and interacted with attending members of R&DA.

1.3 Recommendations

It is recommended that a new Short Term Project, "Technology Application and Assessment" be developed to continue the major activities conducted during this Short Term Project including participation in the Combat Ration Process Action Teams, interaction with and assistance to the DPSC Industrial Base Preparedness group, and participation in the R&DA programs.

The experiences with Horizontal/Form/Fill Seal acceptance and plant floor implementation efforts result in the recommendation that a Multivac HFFS machine be located at the Food Manufacturing Technology Facility (Demonstration Site). Such a move would improve the implementation process by taking advantage of the resources of the FMT Facility to resolve design and operating difficulties. Similarly, as new filling and inspection equipment is identified

for the Multivac it should be installed at FMT and fully accepted and integrated with the Multivac before beginning installation at Combat Ration Producer sites.

Demonstration/Training Workshops held at the FMT Facility would be more valuable if conducted on the identical equipment employed at Producer sites. Resources of the FMT can more readily be committed to such Workshops than is the case at the average Producer Site.

2.0 Program Management

STP #68 was a single-phase work activity having the following general objectives:

Problem Specification, Requirements Analysis and System Definition (Task 4.2.1). As originally proposed, problems and requirements were expected to be on an individual producer basis. During execution of the Short Term Project, the task was conducted through Process Action Teams and other Industry/Government joint forums.

Implementation Planning and Scheduling (Task 4.2.2). Consistent with revisions to Task 4.2.1, above, this task became support to the Industrial Base Preparedness Group in DPSC. The IBP group has responsibility of implementing those technologies at producer sites (e.g. HFFS).

Availability of the Food Manufacturing Technology Facility (Task 4.2.3). Make the FMT Facility available to demonstrate, simulate, or validate the system improvements, and to train personnel as required, within the capacity of the FMT Facility schedule.

Producer Assistance (Task 4.2.4). Provide assistance while the ration producer is installing the new features on-line in his enterprise, and gather resulting data for evaluation and further improvement.

Industry-Wide Implementation Assistance - HFFS (Task 4.2.5). Provide assistance to the ration producers on industry-wide implementation programs, specifically technology related to horizontal form/fill/seal (HFFS).

2.1 Summary of STP Accomplishments

- Continued participation in the MRE Process Action Team chaired by DPSC.
- Began participation in newly formed Heat & Serve Process Action Team (DPSC).
- Began participation in newly formed Specification Process Action Team (Natick chair)

- Provided cost and delivery schedule estimates to DPSC IBP group regarding advanced filling equipment.
- Participated in the HFFS equipment inspection trip to Ulm, Germany. Also, supplied test equipment and formed pouch molds.
- Participated in initial Combat Ration Producer HFFS acceptance tests and subsequent second tests.
- Worked with Combat Ration Producer and HFFS machine manufacturer at CRAMTD Demonstration Site to conduct production run on CRAMTD Tiromat HFFS.
- Participated in the 1996 Retort Quality meeting along with Combat Ration Producers, USDA Inspectors, AVIs and DPSC.
- Provided CRAMTD exhibit "Developmental Manufacture" at the 1996 R&DA Golden Anniversary Meeting and Exposition.

3.0 Short Term Project Activities

3.1 STP Tasks

3.1.1 Problem Specification, Requirements Analysis (Task 4.2.1)

3.1.1.1 MRE Process Action Team

On behalf of CRAMTD, John Coburn has been a member of the MRE PAT since 1992. Following successful completion of the PAT Mission with respect to replacement of the Himont resin in the seal layer of the foil laminate, the team transitioned from solving a specific problem to a forum on various packaging topics. These topics have included: Horizontal Form/Fill/Seal Issues, Seal Detection Equipment, Second Generation Films, and Standardized Tests to Compare Film Performance. Coburn participated in the February 27, 1996 MRE Process Action Team Meeting at DPSC.

During discussion of seal integrity testing, pointed out that the new vacuum levels available with the HFFS machines increase the difficulty in detecting leaks based on current technology (vacuum chamber). Higher residual air levels, including modified atmosphere packaging may be desireable. Rutgers agreed to prepare pouches with varying head space and send them to Natick for rough handling testing. Coburn also proposed that the effect of oxygen levels on shelf life be determined in a Short Term Project (based on advanced analysis developed during the Natick-CAFT QQECR Program).

The producers expressed interest in holding a Pouch Integrity Workshop prior to the end of the CRAMTD Project. Coburn, who suggested that such a workshop could provide valuable feedback, agreed to attempt to have the workshop ASAP.

3.1.1.2 Heat & Serve Process Action Team

Ted Descovich participated in the January 23-24, 1996 organizational meeting of the Heat & Serve PAT held at DPSC. This new PAT, chaired by DPSC will examine the "Heat & Serve" portion of the military feeding system. The military approach to Heat & Serve could take a number of directions: Institutional HFFS Pouch, Improved Metal Can, Polymeric Tray, or a combination. The Institutional Pouch was dropped from future focus, although Multivac may continue to look at issues and provide updates.

Ted Descovich participated in the March 12-13th Heat & Serve Process Action Team meeting at DPSC. He presented CRAMTD information, including handouts (Appendix 4.2), on the Mullinix CPET (40 and 60 mil) trays, both the foil laminate and nylon lid stocks and the Raque heat seal machine change parts.

At a May 16, 1996 meeting held in connection with the San Antonio R&DA meeting and attended by Descovich, Mullinix presented information on their company, manufacturing capability and technical information on their CPET half steam-table tray. Central States Can presented a summary of hand-held can openers for the existing metal tray with ratings and costs of each. Natick reviewed their preliminary impact/rough handling and cold weather handling test results on the Rexam and Mullinix polymeric trays. Natick indicated that further testing is needed on shelf life.

3.1.1.3 Specifications Process Action Team

Immediately following the Retort Pouch Conference, an initial meeting of the Specification PAT, or SPAT was held chaired by Natick's Raymond Valvano. The SPAT is the outcome of a group of R&DA Workshops from the Fall 1995 Meeting. The mission of the SPAT is to reduce problems associated with the transition to performance specifications for operational rations. The SPAT is to explore ways to streamline the specification development (including review of the specification language to ensure it meets the customer's requirements without unnecessary restrictions), review, approval and change processes.

John Coburn participated in the March 25-27th Specification Process Action Team meeting at Natick. This first official meeting included 16 PAT members. The Team, headed by Ray Valvano of Natick, developed replies to the issues raised at the Fall 95 R&DA Meeting and also generated a Road Map of the "Specification Development & Acquisition Process" (with annotated process times)(Appendix 4.3).

Two meetings of the SPAT were held in connection with the R&DA San Antonio meeting (May 14 and 15). The Team (including Coburn) continued to address draft performance specifications for MRE rations with Pork Chops (Jamaica Style, Boneless, with Noodles and Sauce) used as the working model. Among the broader issues discussed were "drain weight" and "shelf life".

The SPAT also met June 11-13, 1996 at Natick but Coburn was unable to attend because of conflicts with the impending CRAMTD End of Contract Briefing.

3.1.2 Implementation Planning (Task 4.2.2)

High production rate utilization of the HFFS machines procured by the Combat Ration Producers will require the use of automated filling equipment. For placeable items, the major equipment required is the robot(s) (placeable items) and an Oden Liquid Filler (sauce/gravy). This equipment is in place for the Tiromat, 6-up, HFFS machine at the CRAMTD Demonstration Site.

During February provided estimates of advanced filling equipment costs to the Industrial Base Preparedness group, DPSC (costs based on CRAMTD subcontract amounts plus considered estimates). Also provided estimates of delivery times for an Oden 8-head filler (as would be used with the 8-up Multivac HFFS machines and for an Adept PackOne robot (with vision/conveyor systems). Received written quotation from Oden for an 8-head automatic liquid filling system.

3.1.3 Food Manufacturing Technology Facility Availability (Task 4.2.3)

Two employees of Shelf Stable Foods and one from Multivac visited the Food Manufacturing Technology Facility on April 11 and 12th at which time they conducted Tiromat HFFS test runs. Following packaging, the production was retorted in order to provide shelf stability (samples still labelled experimental since no process was filed).

Seal wrinkles observed at the November Multivac and March Combat Ration Producer tests have not been characteristic of product produced on the Tiromat at CRAMTD. Neal Litman hosted the Shelf Stable Foods/Multivac visit and provided hands-on assistance in the production runs and demonstration/workshop.

3.1.4 Producer Assistance (Task 4.2.4)

3.1.4.1 MRE Retort Pouch Conference

John Coburn attended the January 10-11, 1996 Retort Pouch Quality meeting held in Cincinnati. This was an excellent opportunity for the participants in the MRE system to interact i.e., the Producers, the USDA Plant Inspectors, the AVIs, and the Procurement representatives. Coburn was invited to address the group and provided handouts for the proposed CRAMTD "Workshop on Quality Engineering", "Leak Detector Implementation, CSTP #75" (Attachment 4.4), and "TWP 106, A Producibility Index with Process Capability and Manufacturing Cost". CRAMTD was requested to host a future meeting of the USDA/AVIs which would allow them to see the HFFS product and equipment as well as the CRAMTD Demonstration Site.

3.1.4.2 R&DA Exhibit

CRAMTD participated in the May 13-15, 1996 R&DA Golden Anniversary Meeting and Exposition in San Antonio. The CRAMTD exhibit illustrated the "Developmental Manufacture" stage of R&D that addresses demonstration of the manufacturability of a new or improved product in the mode of a commercial enterprise (Appendix 4.5). It includes product development, all aspects of production start-up, and operations. A computer video display summarized CRAMTD recent accomplishments (Appendix 4.6).

3.1.5 HFFS Assistance (Task 4.2.5)

3.1.5.1 Multivac Plant Visit (Ulm)

Ted Descovich participated in the Multivac HFFS equipment inspection trip to Ulm, Germany, November 5-10, 1995. The purpose of the inspection was to observe Multivac's demonstration that the equipment is capable of producing conforming MRE pouch poduct. Ted along with Peter Sherman (Natick) were the key active technical personnel representing U.S. Government/Industry. Other U.S. participants included Nancy Chester and Carmen Viola, DPSC, and representatives from Smurfit, Reynolds, and Shelf Stable Foods.

Prior to the trip to Germany, CRAMTD shipped its laboratory pouch burst tester to Multivac so that tesing could occur during the inspection runs.

Also in conjunction with the Multivac inspection, plaster molds of the formed pouches at CRAMTD from its Tiromat were taken to Germany to assist Multivac engineers in setting up their machine.

3.1.5.2 Initial Combat Ration Producer Tests (March 5, 1996)

Neal Litman participated in the March 5-6th acceptance testing production run held at Shelf Stable Foods, Cincinatti. During the test runs: turned off plug assist, installed pressure gage and recommended adding a pressure regulator and flow control valve, adjusted seal conditions and recommended changes to the sealing system, adjusted pouch draw to reduce height of product above web line, and adjusted package evacuation set point. Test on a foil laminate alternative to the Reynolds film resulted in increased wrinkling and seal failure with significantly less formability.

3.1.5.3 Second Combat Ration Producer Tests (June 26, 1996)

Ted Descovich and Neal Litman attended the second U.S. Producer HFFS acceptance tests held at Shelf Stable Foods, June 26 and 27th.

Multivac technicians had changed from those at the first acceptance tests and those who had visited the FMT Facility (to witness/conduct runs on the Tiromat HFFS).

Overall, the June 26 and 27th tests were not successful. Sealing temperatures were considerably higher (set point of 230°C vs 215°C) than used at CRAMTD with the result that packaging film scorching was observed. Pouch forming was insufficient in depth and

conformation to satisfactorily hold the products. A major factor was the low forming pressure compared to CRAMTD and to the earlier tests (22 psi vs 32 psi). Wrinkling of the pouch material in the sealing area was observed on the majority of the pouches.

4.0 Appendix

4.1 Figure 1 CRAMTD STP #68 Time and Events Milestones
4.2 CRAMTD Handouts, Rigid Polymeric Container Processing, March 12-13, 1996
4.3 SPAT, Specification Development & Acquisition Map and Timetable
4.4 CRAMTD Handout, Leak Detector Implementation, January 10-11, 1996
4.5 "Developmental Manufacture", R&DA, May 13-15, 1996
4.6 CRAMTD Accomplishments Summary, May 13-15, 1996

Figure 1 - CRAMTD Candidate Short Term Project #68
Technology Application and Consulting
Program Plan and Schedule

Task Name	Reference	1995			1996					
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Phase I										
Problem Spec, Req. Analysis	4.2.1									
Implementation Planning	4.2.2									
FMTF Availability	4.2.3									
Producer Assistance	4.2.4									
HFFS Assistance	4.2.5									
Final Reports and Summaries	4.2.6									

Printed: 07/2/96

RIGID POLYMERIC CONTAINER PROCESSING

STP 10

PROCESS ACTION TEAM (PAT) MEETING MARCH 12-13, 1996

MULLINIX HALF STEAM TABLE TRAY

* CPET - 60 MIL

* FLANGE MODIFIED FOR IMPROVED SEALING

* DUAL OVENABLE

* RETORTABLE

* COST $.67/TRAY

DUAL USE- COMMERCIAL PRODUCT

* CPET - 40 MIL

* RUTGERS HAS ORDER FOR 600 TRAYS/WEEK

* LARGE SUPERMARKET CHAIN (150 STORES)

* PRODUCT IS 6# OF MACARONI & CHEESE

* PRODUCT SOLD IN DELI DEPARTMENT

* COST $.47/TRAY

* OTHER FUTURE PRODUCT - 3# TRAY

CPET Line

SPECIFICATIONS

PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX3000-16	3.000	1.570	4.09 OZ.

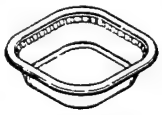
PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX3000-19	3.000	1.935	4.89 OZ.

PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX5061-19	4.985	1.875	11.00 OZ.

PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX5200-09	4.932	0.926	(Polypropylene Lid for MX5061-19)

PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX7200-15	7.188	1.500	22.75 OZ.

PART ID #	TOP DIA.	HEIGHT	APPROX. FLUID CAPACITY
MX7900-08	7.938	0.818	16.25 OZ.



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MX4343-12	4.312	4.312	1.250	10.50 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX5060-14	5.00	6.00	1.375	15.00 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX5066-15	5.00	6.625	1.500	18.50 OZ.

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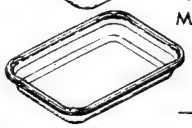
MX6275-14	6.250	7.500	1.375	26.75 OZ.



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MX6290-15	6.250	9.000	1.500	32.75 OZ.

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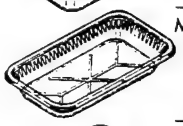
MX84120-18	8.375	12.000	1.812	67.50 OZ.



PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX69128-18	6.875	12.750	1.805	48.00 OZ.

35 mil 28-31 ₱

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX104128-17	10.375	12.750	1.750	81.375 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX5170-13	5.125	7.000	1.281	13.00 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX5279-14	5.258	7.884	1.375	16.00 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX6088-15	5.961	8.800	1.500	22.25 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX6088-12	5.960	8.800	1.224	LARGE=6.750 OZ. SMALL=5.500 OZ. ea.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX6290-11	6.250	9.000	1.125	LARGE=15.25 OZ. SMALL=6.50 OZ.

PART ID #	TOP WIDTH	TOP LENGTH	HEIGHT	APPROX. FLUID CAPACITY
MX7090-12-3	7.000	9.000	1.250	LARGE=14.50 OZ. SMALL= 5.4 OZ. ea.

- COLORS: black, bone & ivory
- Many OPS domes available upon request
- Also available in APET for non microwave/oven use
- Please call Mullinix for other sizes and depths available

SAMPLE REQUEST FORM

Fax this request form to Mullinix at: 219 747 1598

Yes. I am interested in Mullinix packaging concepts.

❑ Have a Salesman call ❑ Send more information ❑ Send samples

Contact person: _____

Company Name: _____

Shipping Address: Street: _____

City: _____ State _____ Zip _____

Phone: _____ Fax: _____

Mailing Address: Street: _____

City: _____ State _____ Zip _____

Please send the following samples:

Package description (Part ID. #)	Quantity
Notes:	

Convenient Excellence

Packages, Inc., brings convenience and durability to plastic food packaging. A quality producer of CPET food containers, Mullinix designs and thermoforms dual-ovenable packaging at cost-competitive prices.

The unique advantages of CPET packaging include:

■ ***Convenience:***
Dual-ovenability – from freezer, to microwave or conventional oven, to table.

■ ***Cosmetic appearance:***
Designs to enhance your dining decor or complement any lifestyle.

Mullinix introduced CPET food trays to the airline industry in 1983 and the food industry in 1984. Further, the company was the first to co-extrude CPET with a virgin amorphous layer for a superior sealing surface, no contaminants to come in contact with food, and increased cold-temperature impact strength.

Mullinix cares about its customers and works with them from design through final production. An extensive range of containers, as shown on the reverse side, is also available in stock for quick delivery. Whether custom design or stock items, Mullinix can supply your packaging needs, quickly and efficiently.

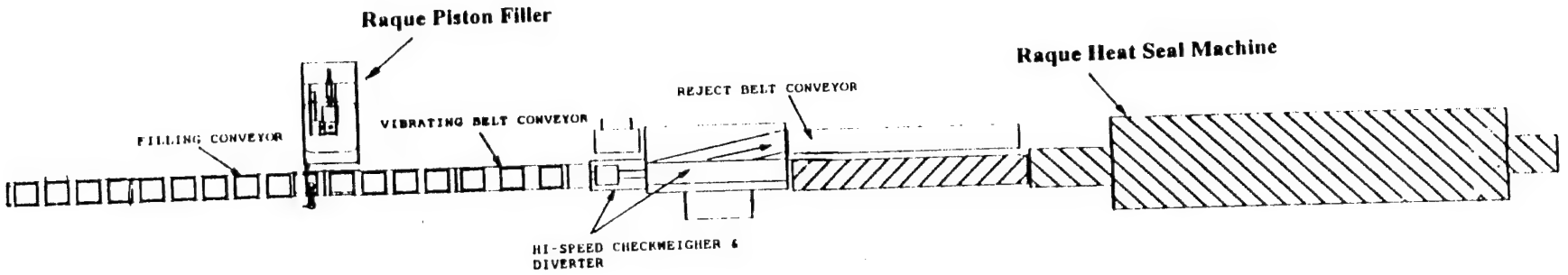
Mullinix Packages, Inc.
3511 Engle Road
Fort Wayne, Indiana 46809
Phone: 219 747 3149
Fax: 219 747 1598

TRAY LID MATERIAL

* MILITARY - FOIL LAMINATE - COST $.26/TRAY

* CIVILIAN - NYLON - COST $.12/TRAY

RIGID POLYMERIC TRAY



HALF STEAM TABLE TRAY PACK PACKAGING LINE

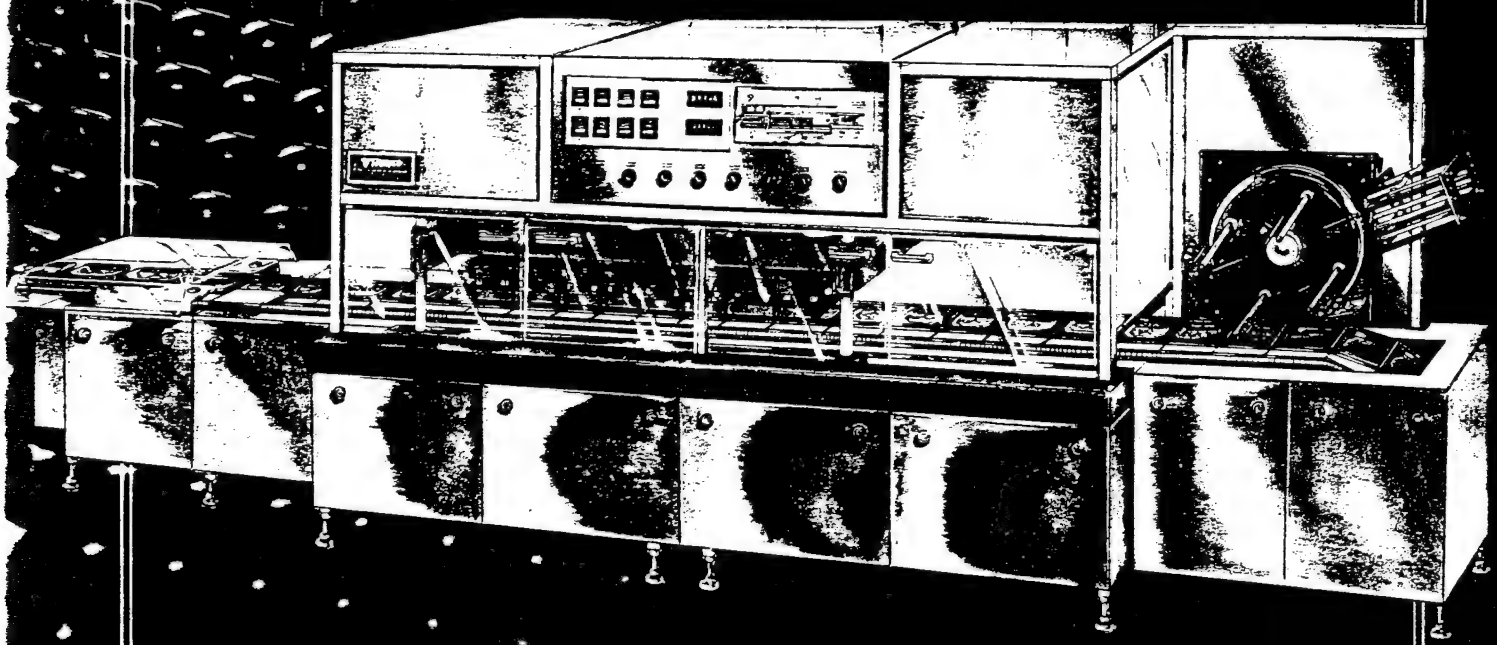
RAQUE HEAT SEAL MACHINE CHANGE PARTS
(1/4 STEAM TABLE TRAY)

* TRAY CARRIERS	19,000
* SEALING PLATENS	4,800
* DIE CUT HEAD ASSEMBLY	6,500
* LIFTER PADS	1,500
TOTAL	$31,800

Raque Food Systems

INTRODUCES

Sealing Technology of the 90's



HSL - 100

STP #10

Automatic Sealing System using printed board containers and lids with single and multiple compartments.

Model HSL-100 Heat Sealer

- Reduced packaging
- Dual ovenable
- Easy open lid
- Single lane and dual lane design
- Single lane – 125 packages/minute
- Dual lane – 250 packages/minute
- Easy changeover to different size and shape packages
- Modified atmosphere available
- U.S.D.A. Approved

Sealing and Filling Systems

- Turnkey automatic systems up to 250 containers per minute.
- Tray dispensers for ovenable board containers.
- Piston fillers for liquids with particulates and viscous materials. Piston fillers supplied with static hoppers, horizontal blending hoppers, and auger hoppers.
- Rotary plate fillers for vegetables and free flowing dry products.
- Fillers for garnish toppings, such as shredded cheese, bread crumbs, etc.
- Rotary pump fillers for gravies and butter coverage of vegetables.
- Freezer infeeds and freezer outfeeds.
- Check weigher controlled fillers.
- Scale weigh fillers.

Raque
FOOD SYSTEMS, INC.

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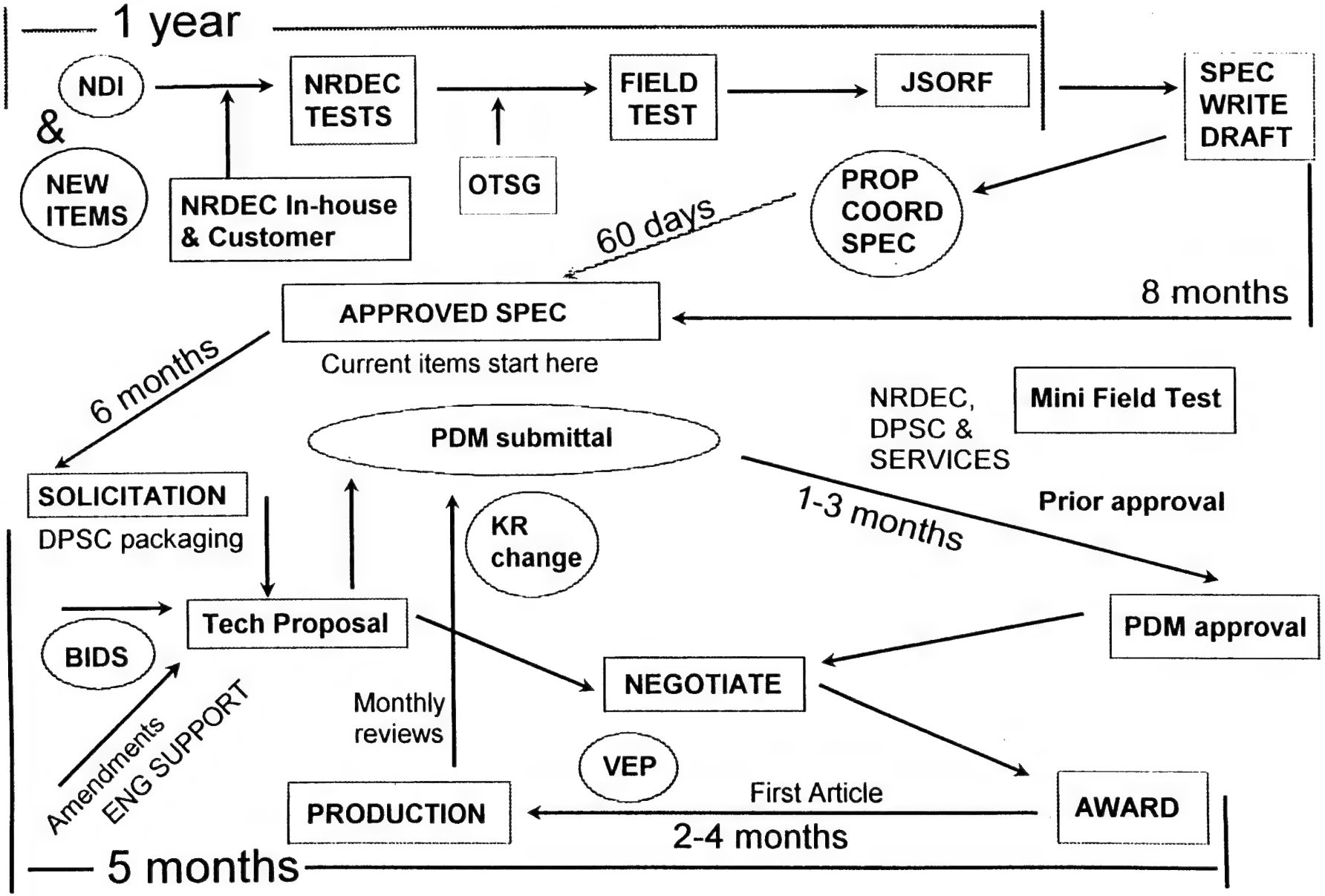
Fax: (49) 26 42 / 2 20 38

Specification Development & Acquisition Process



CRAMTD

Leak Detector Implementation, CSTP #75

Potential Package/Leak Test Equipment Suppliers:

Accu-Pak. Inc., Carrollton, TX
ATEQ Corp., Canton, MI
Carleton Technologies Inc., Orchard Park, IL
Cincinnati Test Systems, Village of Cleves, OH
Enercon Industries, Inc., Menomonee Falls, WI
Forward Technology, Minneapolis, MN
InterTech Development Co., Skokie, IL
Ion Track Instruments (ITI Qualitek), Wilmington, MA
Kenpak Inc., Commerce, CA
L.A.B., Skaneateles, NY
Lancaster Laboratories, Lancaster, PA
Lansmont, Monterey, CA
Lepel Corp., Edgewood, NY
Leberco, Testing, Roselle Park, NJ
Mark-10 Corp., Hicksville, NY
Modern Controls, Inc., Minneapolis, MN
Nikka Densok U.S.A. Inc., Lakewood, CO
Phase 1 Instruments, Dayton, OH
Pillar Technologies, Hartland, WI
PTI, Tuckahoe, NY
Sencorp Systems, Hyannis, MA
S. Himmelstein & Co., Hoffman Estates, IL
Testing Machines Inc., Montreal, Quebec
T.M. Electronics Inc., Worchester, MA
Uson Corp., Houston, TX

Additional Suppliers will be evaluated as identified.

Benchmarks for ATC-3 Leak Test Unit

Product	Defect	Resid. Gas	Temp.	Accuracy	Test Duration
Ham Slice	150 micron hole	>25 cc	40 F	100%	20-30 sec
Ham Slice	150 micron hole	5 cc	40 F	72%	20-30 sec
Ham Slice	slit hole (.125 inch)	5 cc	40 F	88%	45 sec
Ham Slice	large hole	5 cc	40 F	88%	45 sec
Ham Slice in Carton	slit hole	5 cc	40 F	78%	45 sec
Beef Stew	150 micron hole	>25 cc	40 F	92%	15-20 sec
Beef Stew	150 micron hole	5 cc	40 F	54%	10-60 sec
Beef Stew in Carton	slit hole	5 cc	40F	ind.	45 sec
Chicken Stew	slit hole	1 cc	150 F	ind.	40 sec
Chicken Stew	slit hole	1 cc	94 F	ind.	40 sec
Chicken Breast	slit hole	7 cc	72 F	88%	40 sec

"Developmental Manufacture"

CRAMTD Exhibit at the
R&DA Exposition in San Antonio

May 13 -15, 1996

R&D demonstration of product manufacturability including:

- Product/Process
- Marketing
- Plant Operations
- Economics

4/22/96

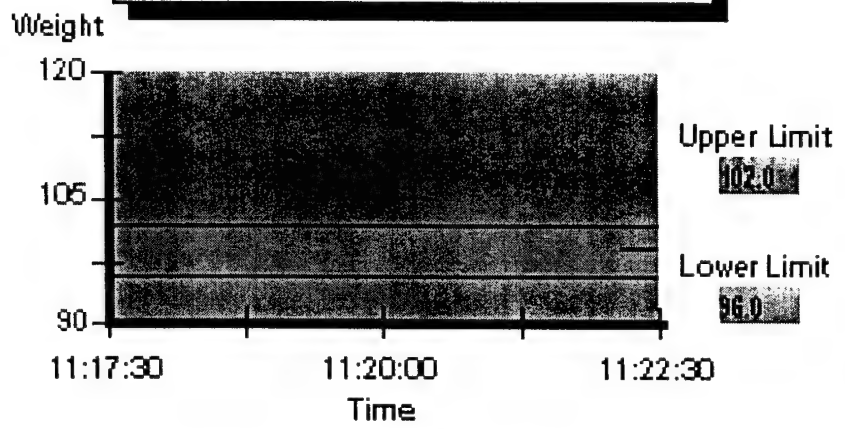
TRAYPACK LINE MAIN SCREEN

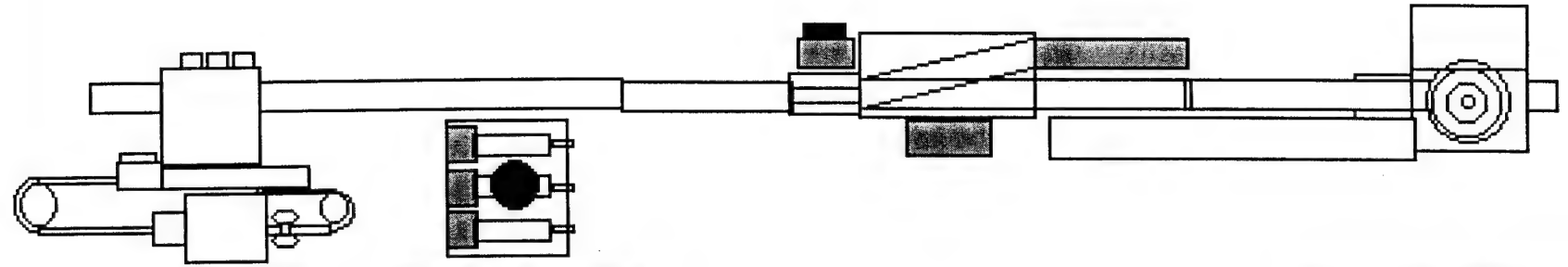
11:22:30 AM

Total Filled:	233
Total Rejected:	3
Underweight:	3
Overweight:	0
Mounded:	0
Total Sealed:	230
Actual Weight:	99.3
Average Weight:	98.9

ALARMS!

Out of Spec: NO Out of Range: NO





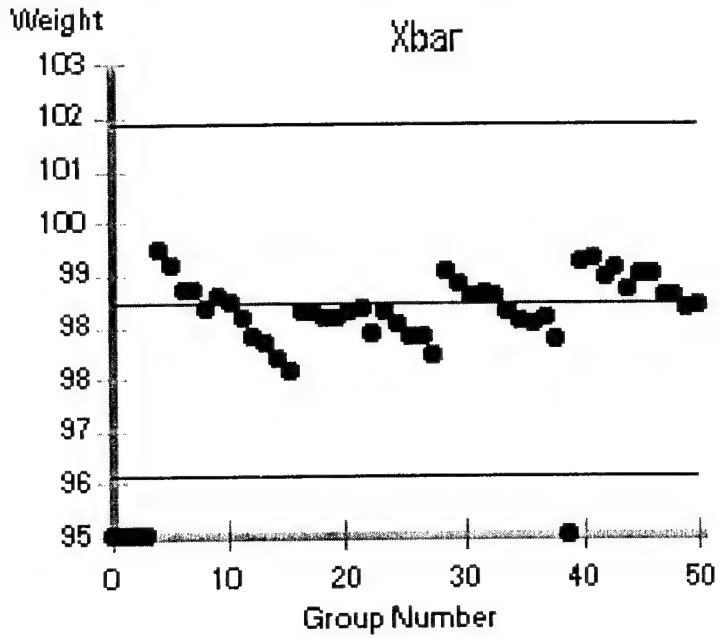
Solbern Timer: 00:00

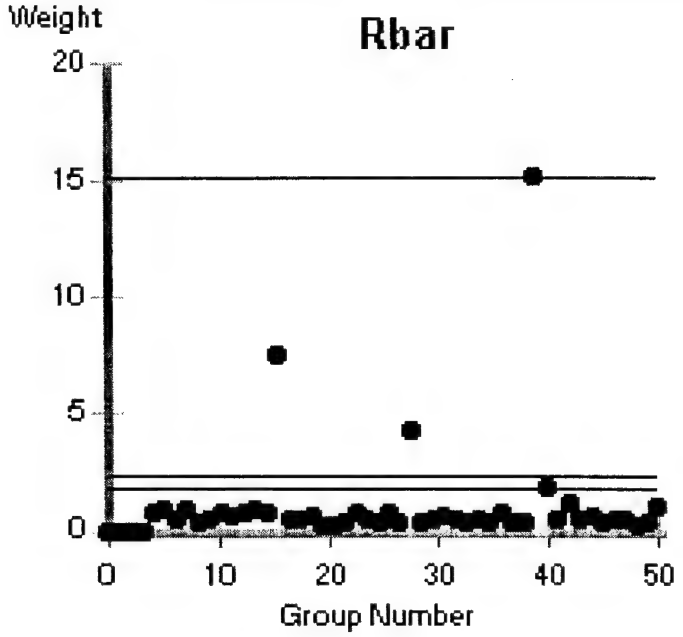
Oden Timer: 00:00

Seamer Timer: 00:00

ANUAL DATA ENTR | CHARTS | COMMENT | LOGIN | LOGOUT | ALARMS | ATERIAL TRACKIN

4/22/96 **Statistical Charts** 11:20:53 AM





No. of groups:	12
No. of Observations: (per group)	5
Upper Spec. Limit (Xbar):	102.00
Lower Spec. Limit (Xbar):	96.00

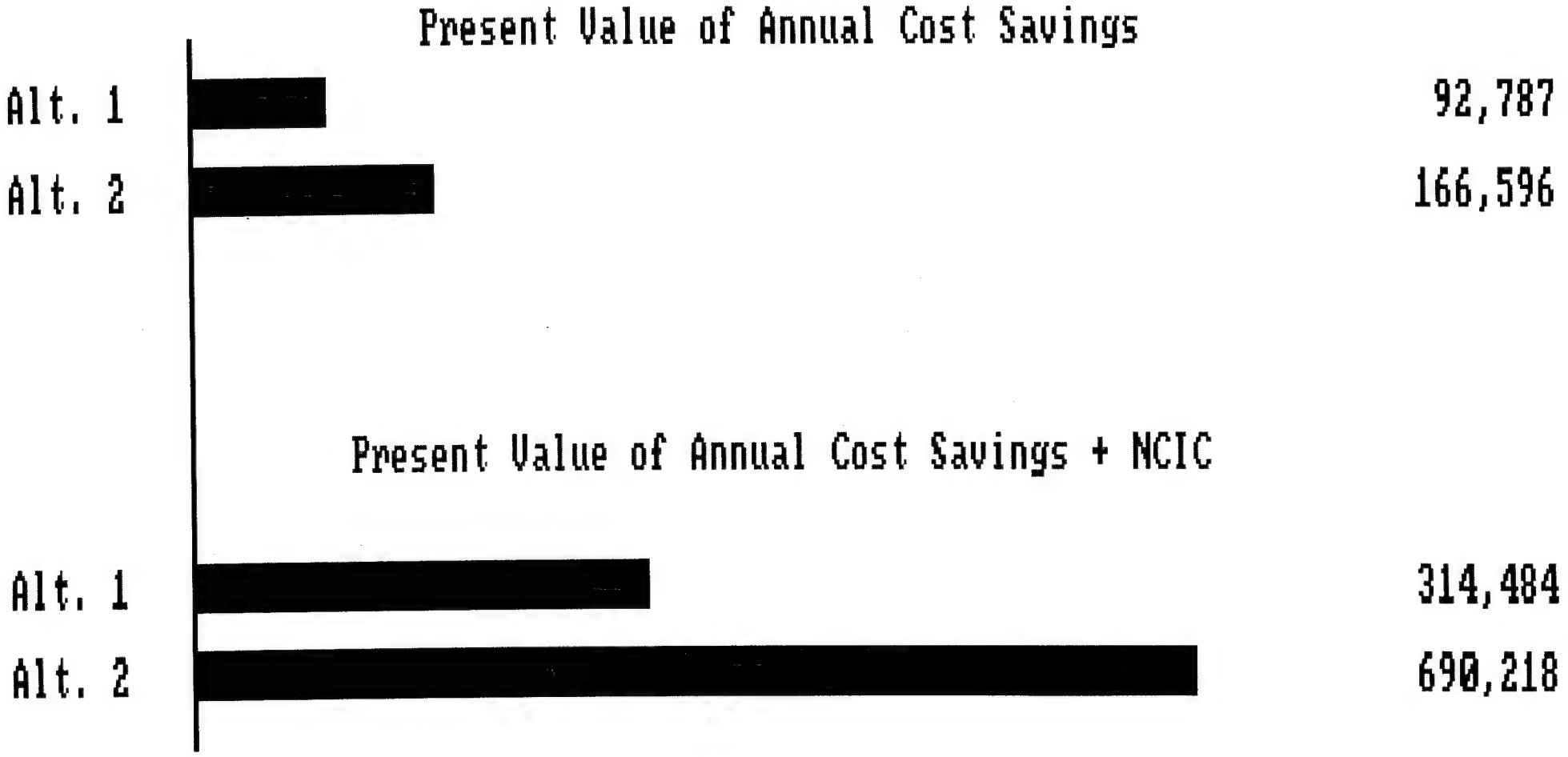
Upper Control Lim. (Rbar):	15.20
Lower Control Lim. (Rbar):	2.40

ALARMS !

Out of Spec:	NO
Out of Range:	NO

RETURN

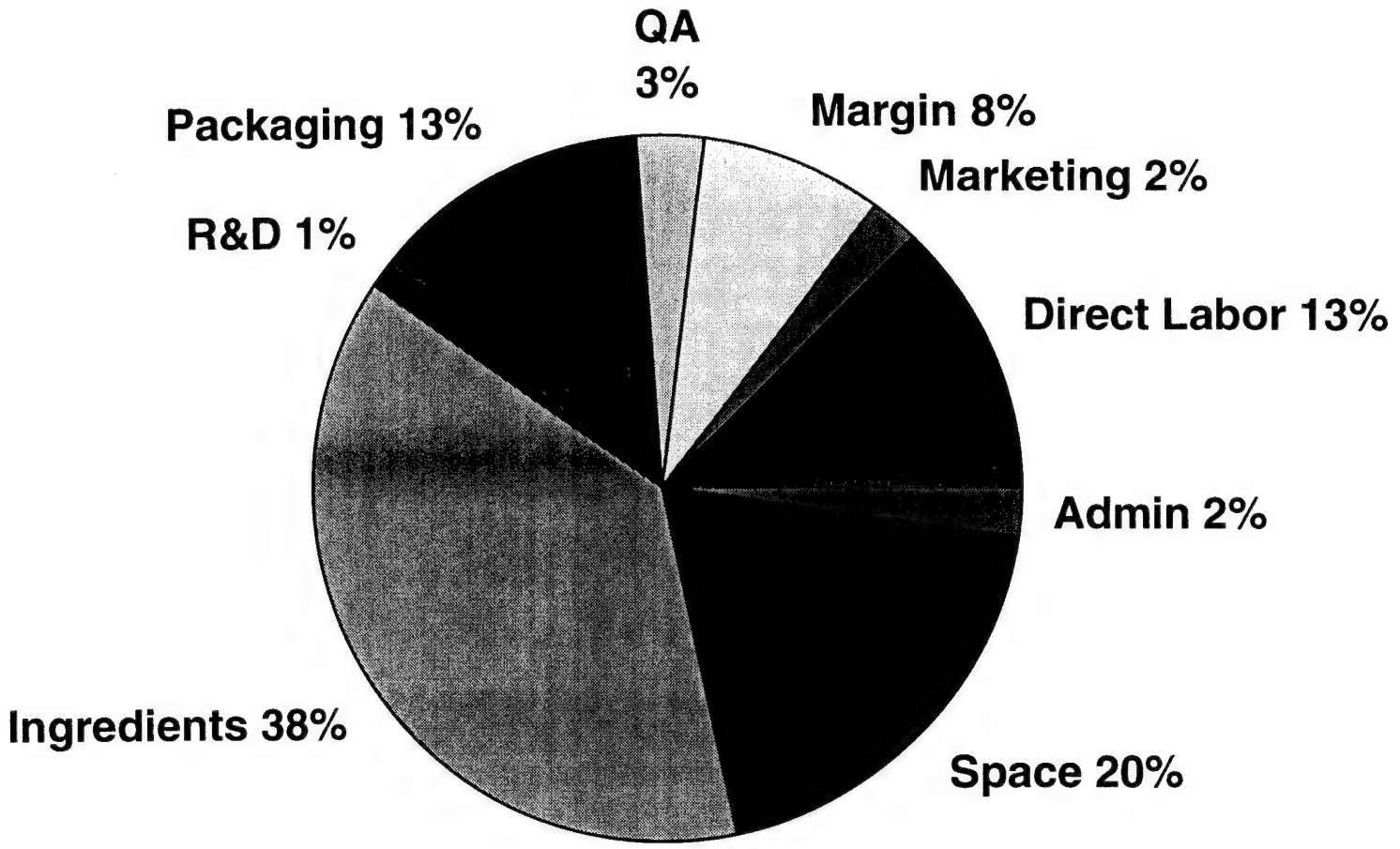
Present Worth Analysis



ESC = System Menu

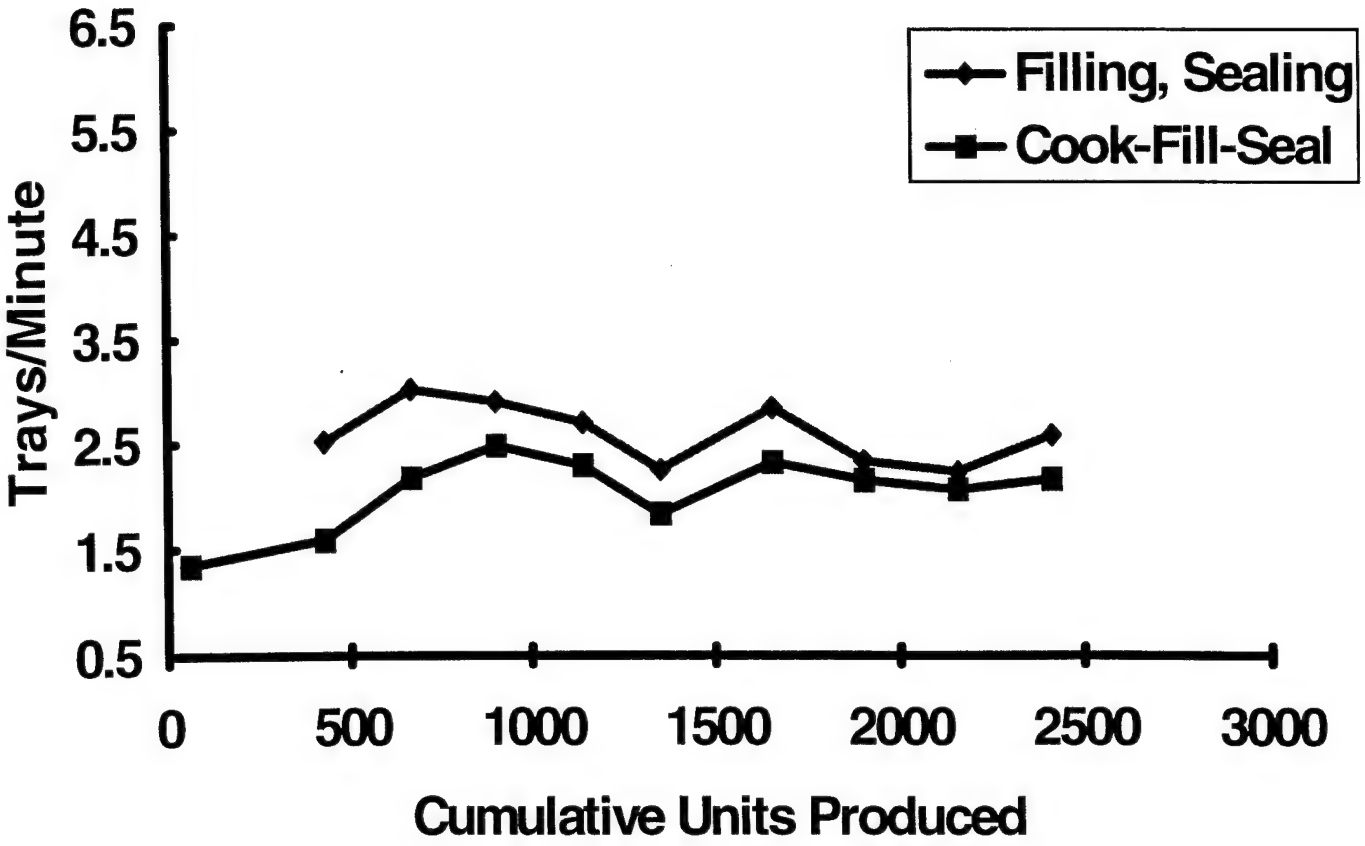
Mac & Cheese (SKU 001, 6-lb Tray)

Cost Breakdown



Manufacturing Demonstration

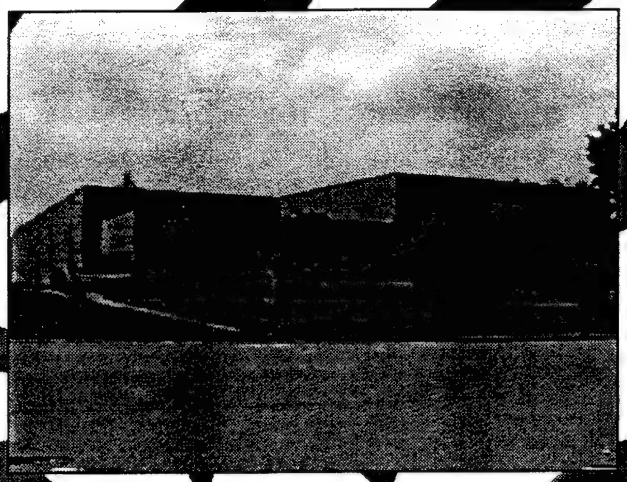
Mac&Cheese Production (SKU 001, 6-lb Tray)



Center for Advanced Food Technology

- **Combat Rations Advanced Manufacturing Technology Demonstration**

CAFT Food Manufacturing Technology Facility

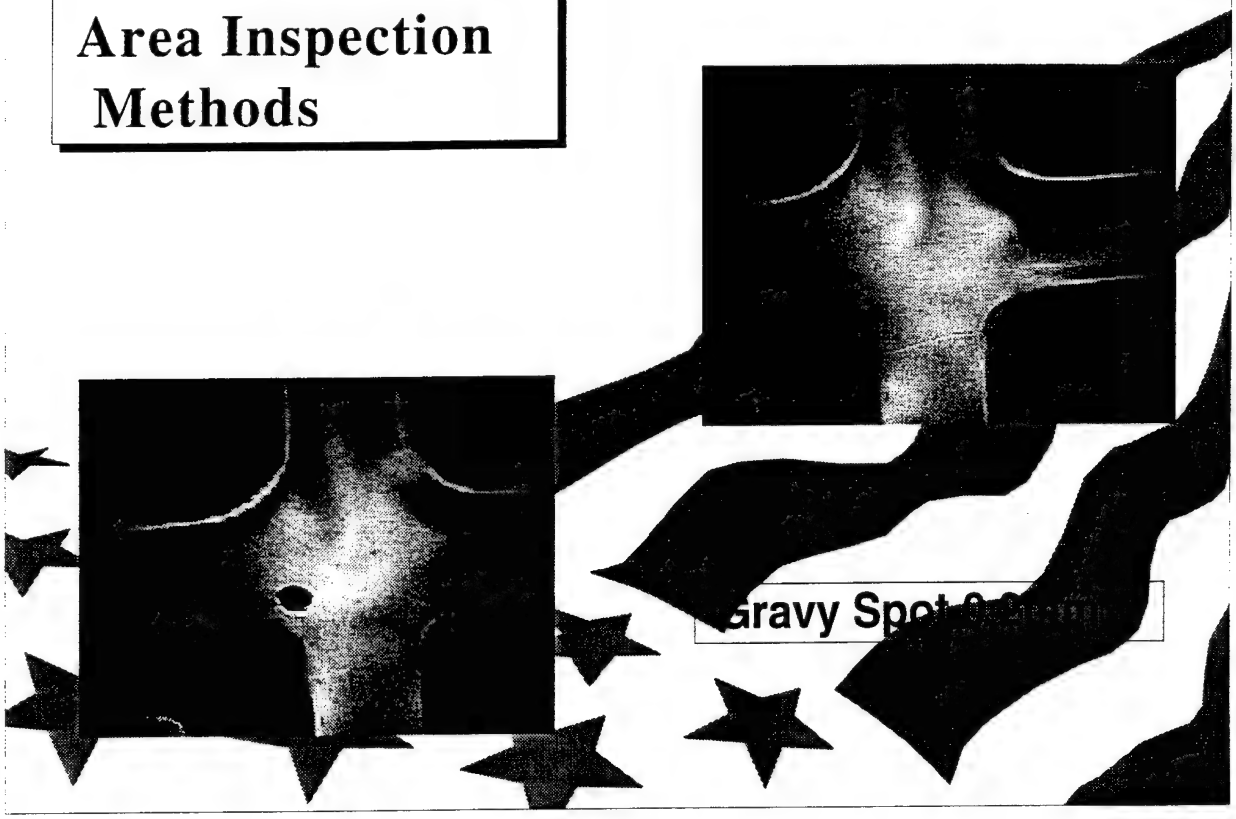


Horizontal Form/Fill/Seal Packaging Increases Product Flexibility

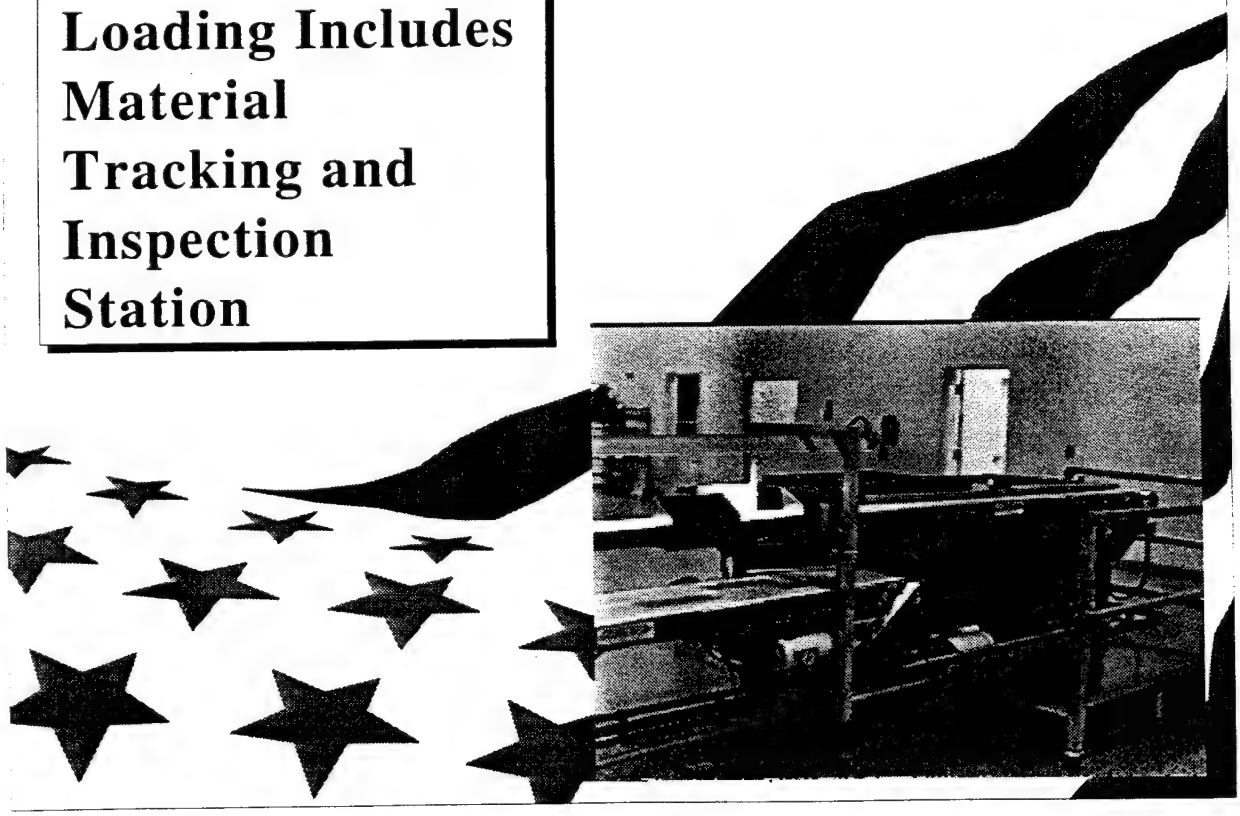
Two-Stage Filling of Particulate Materials

Robot Increases Production Rate of Placeable MRE Items by 10-Fold

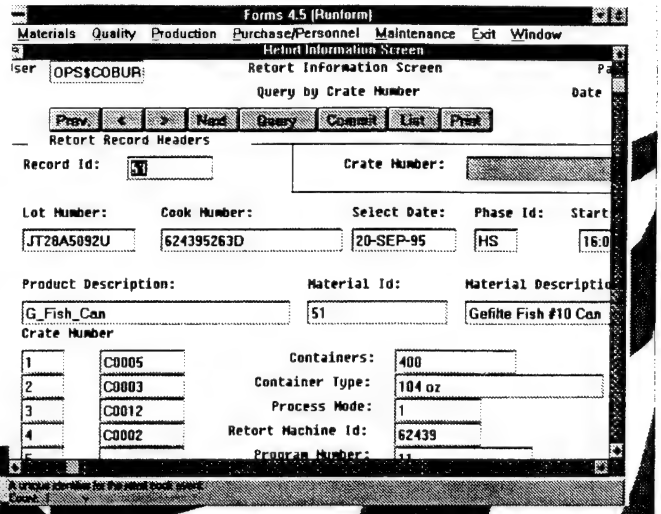
In-Line Seal Area Inspection Methods



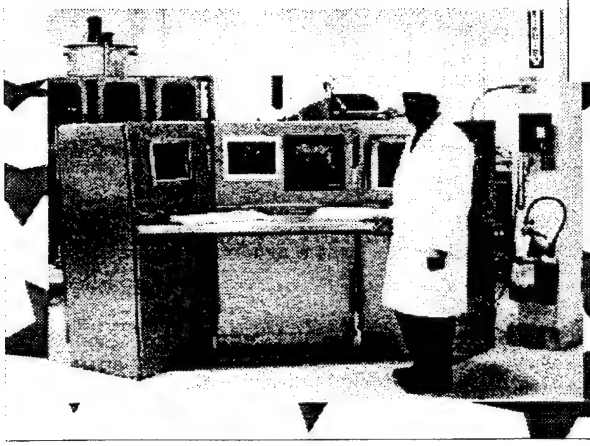
Retort Crate Loading Includes Material Tracking and Inspection Station

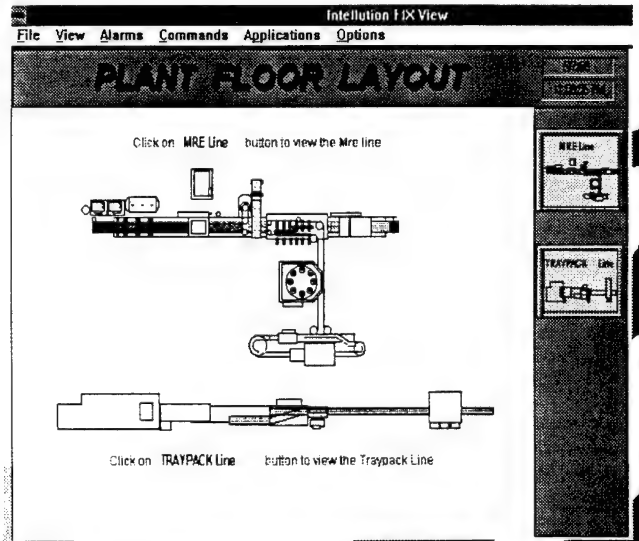


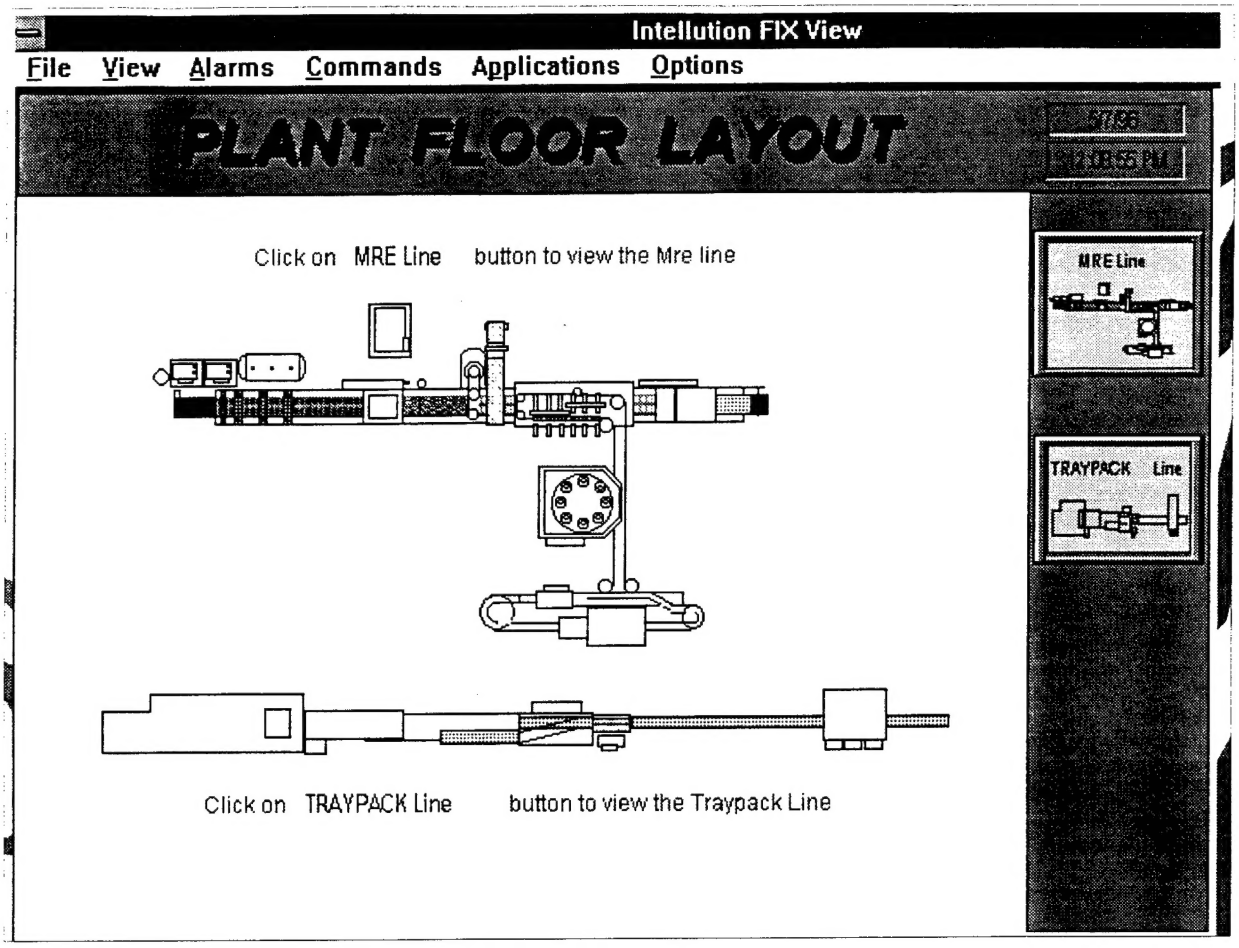
Retort Crate Tracking Provides Material Process Control

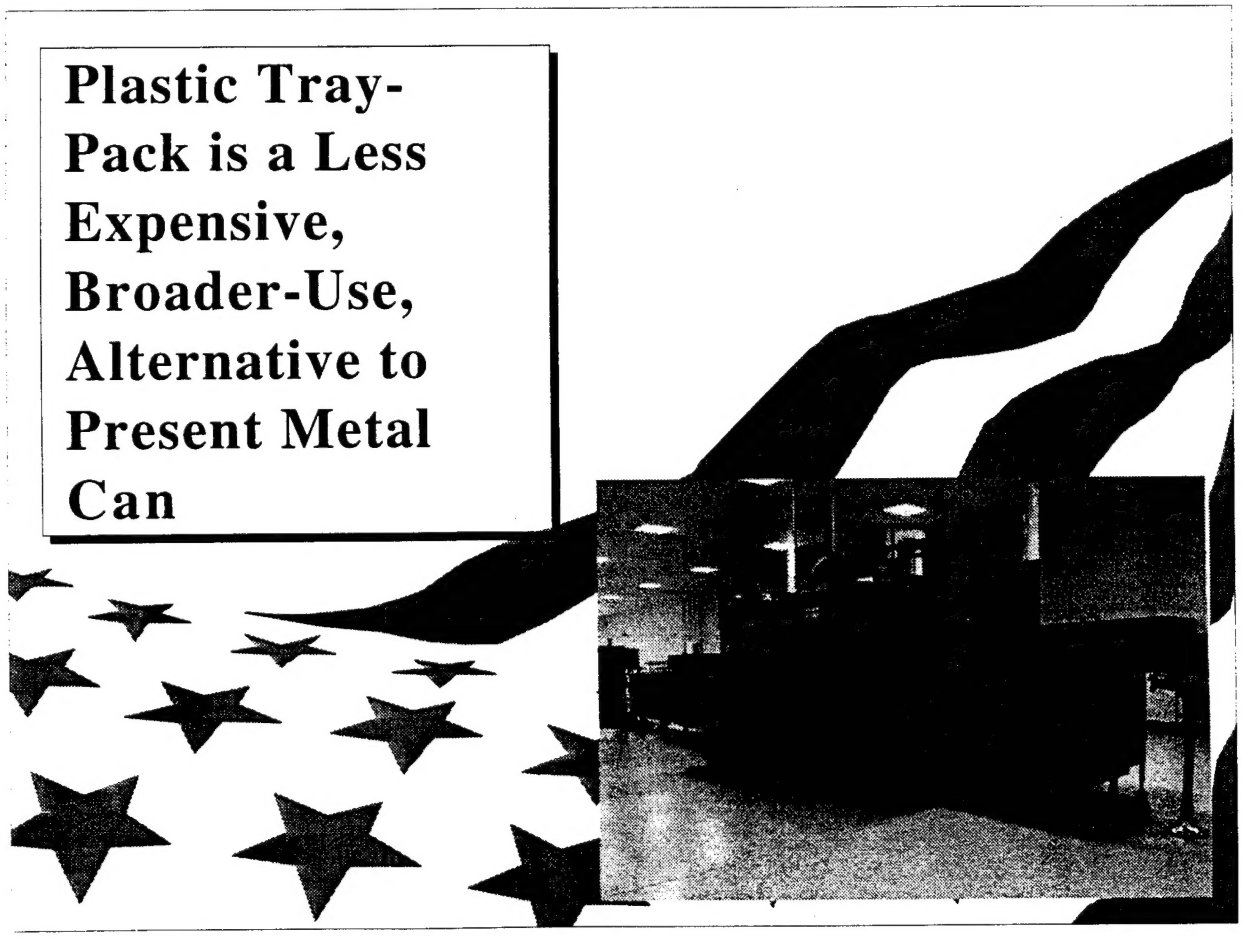


Central Controller Station

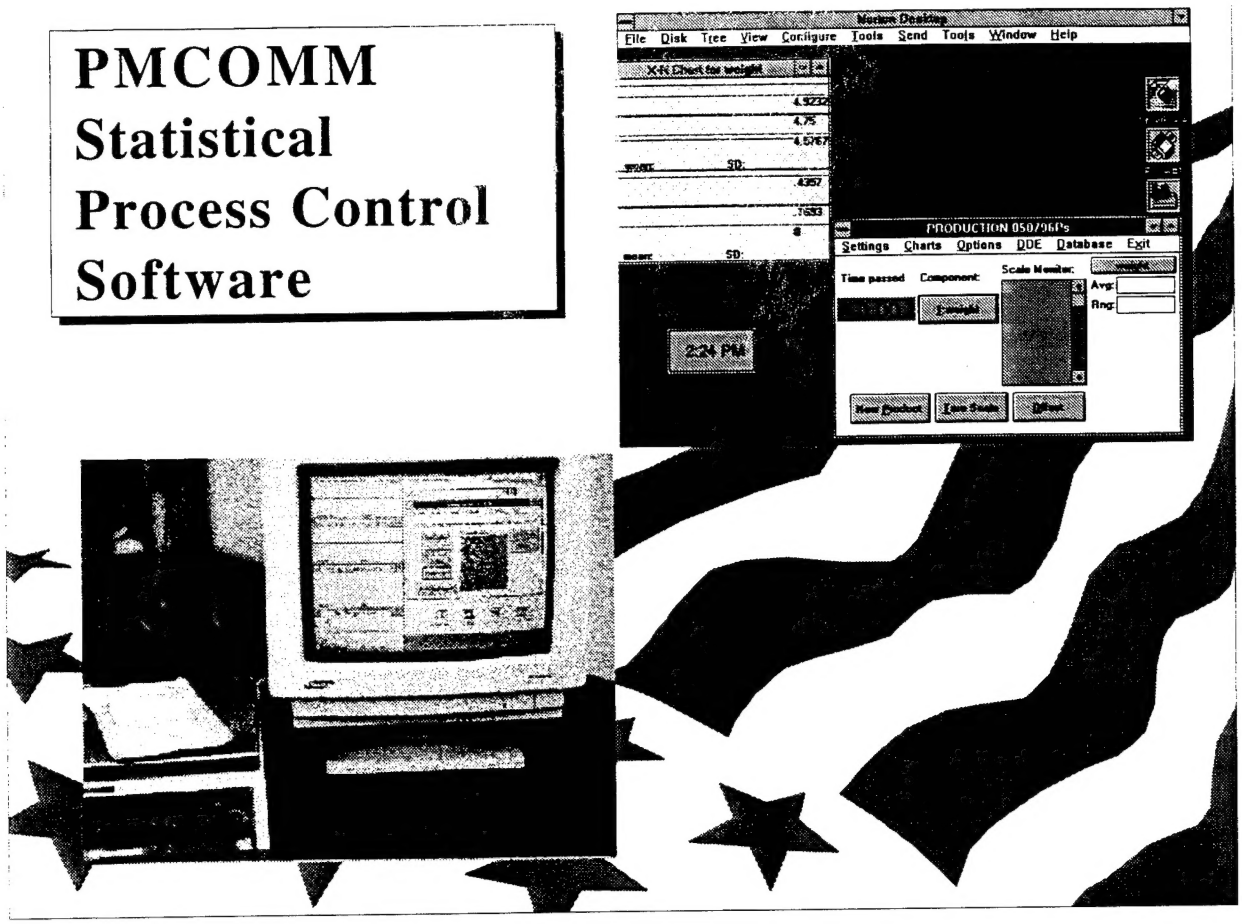




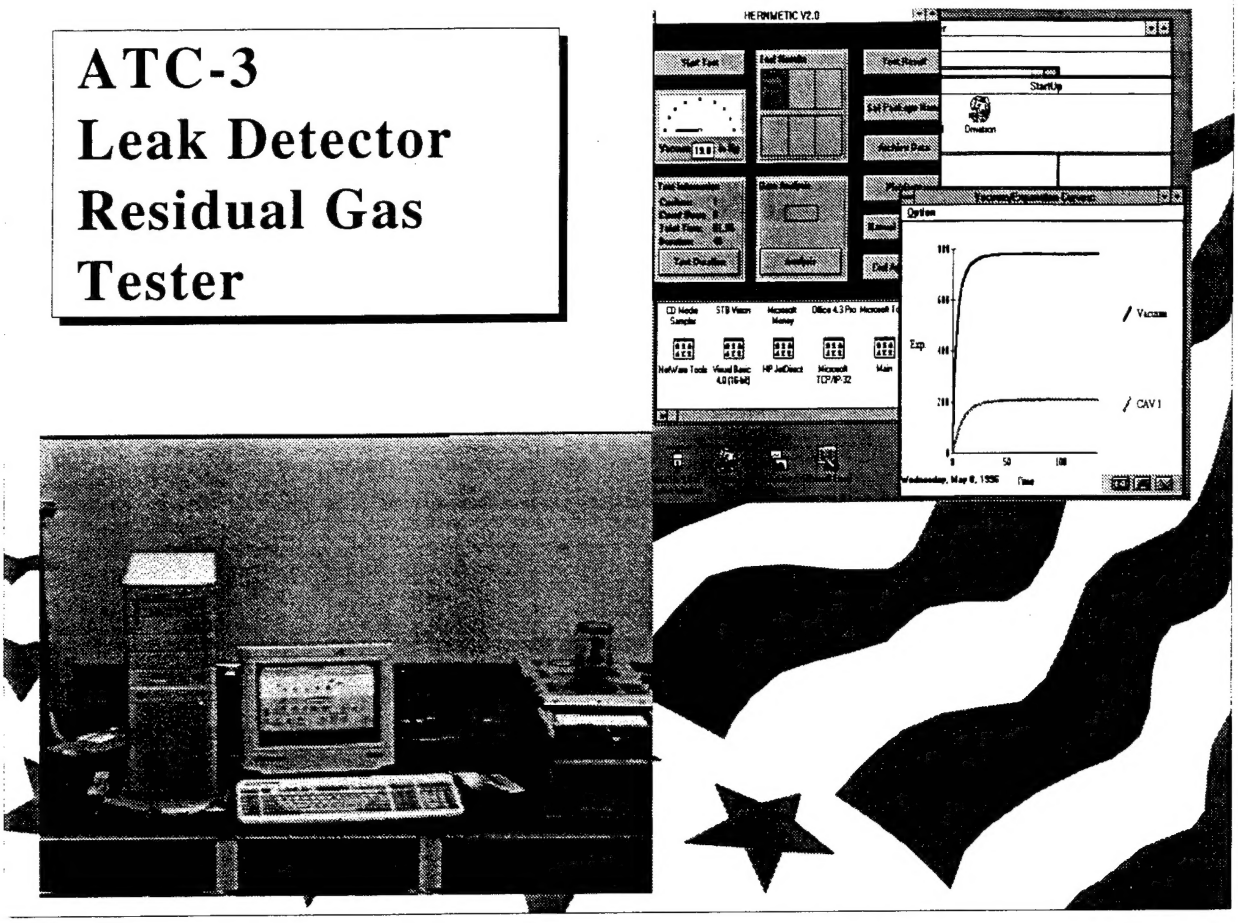

Intellution FIX View
File View Alarms Commands Applications Options
PLANT FLOOR LAYOUT
Click on MRE Line button to view the Mre line
MRE Line
TRAYPACK Line
Click on TRAYPACK Line button to view the Traypack Line

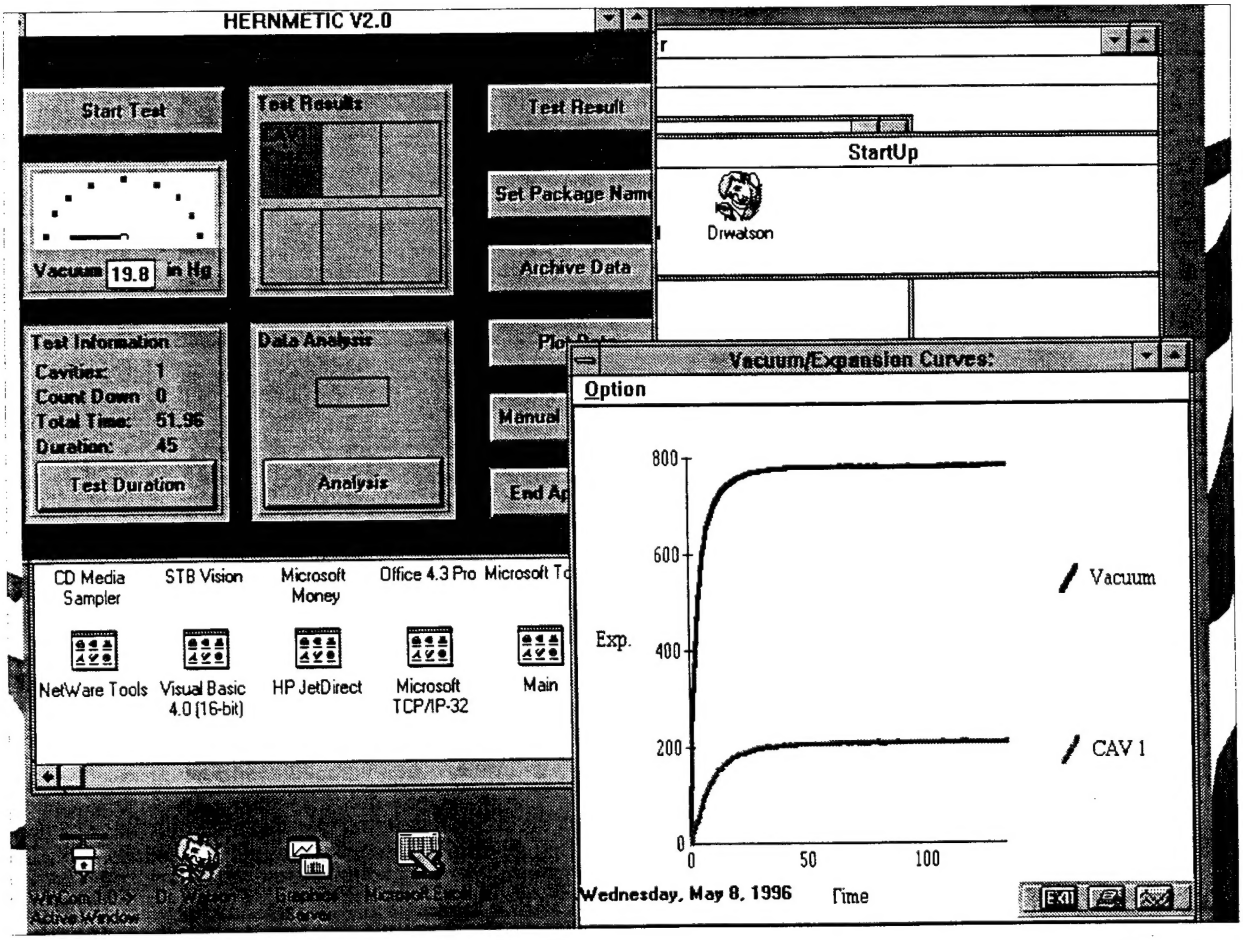

Plastic Tray-Pack is a Less Expensive, Broader-Use, Alternative to Present Metal Can

PMCOMM Statistical Process Control Software



ATC-3
Leak Detector
Residual Gas
Tester





PFMIS
World Wide Web Site

http://pfmis.rutgers.edu